

# PATENT SPECIFICATION (11)

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## (54) ARRANGEMENT FOR SWITCHING ON AND OFF A FILTERING APPARATUS

(71) I, BILL PETER PHILIP NEDERMAN, of Swedish nationality, of Halalid 3, S-252 33 Helsingborg, Sweden, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a filtering apparatus for separating solid particles from welding gases which are created during welding with an electrically-fed welding unit connected by an electric cable to a source of supply, said apparatus comprising a filter element, at least one electrically driven fan for transporting a flow of gas through the filter element, and means for switching said at least one fan on and off.

In order to start and stop a filtering apparatus of the above-mentioned type manually each time the welding operation starts and stops requires extra time, and furthermore the filtering apparatus is functioning for a longer time than necessary which means that the service life of the apparatus is reduced.

The present invention has for its object to eliminate these drawbacks and with simple means obtain an automatic control of the operation of the filtering apparatus, so that said apparatus becomes dependent on the welding operation. This is accomplished according to the invention in a filtering apparatus of the above-mentioned type in that the means for switching said at least one fan on and off comprises at least one switch and means for actuating said switch comprising means capable of responding to the creation or collapse of a magnetic field around the cable due to the flow or cessation of an electric current through the cable.

The invention will now be described more in detail with reference to the accompanying drawings, in which:—

Figure 1 illustrates a filtering apparatus and arrangement according to the invention,

the main components being shown in section;

Figure 2 is a diagram of the electrical circuit including the suction-fan motor of the apparatus, and

Figure 3 illustrates a portion of a filter forming part of the apparatus.

The apparatus illustrated in the drawings is adapted for use in separating solid particles from gases, preferably welding gases, and comprises, on one hand, at least one filter unit 1 including at least one filter element 6, and, on the other hand, at least one power unit 5, preferably an electrically driven suction fan which is adapted to draw a flow of gas through the filter element 6 of filter unit 1.

In order, in this arrangement, to ensure efficient spark arresting and noise reduction, a durable filter having highly efficient filtering properties, as well as convenient assembly and disassembly of a small number of light-weight and dismountable parts, the power unit 5 is disposed within a space or compartment 2 defined, on one hand, by the filter unit 1, and, on the other hand, by two end wall units 3 and 4 of which one end wall unit 3 constitutes a gas inlet unit through which a flow of gas enters the filter unit 1 to be conducted therein so as to pass through said filter element 6, whereas the other end wall unit 4 constitutes a gas outlet end through which gas leaves the apparatus.

In order to construct the filter unit 1 as a sturdy and easily interchangeable unit adapted to withstand internal and external pressure loadings, it is constituted as a separate unit comprising at least one space or compartment 9 defined between an inner cylindrical wall 7 and an outer cylindrical wall 8 and within which the filter element 6 is disposed.

To the end of making this filter unit an interchangeable unit defining the peripheral outer and inner walls of the apparatus and to which the end wall units 3 and 4 are

directly connectable and after connection will have their interior spaces communicating with the interior of the filter unit 1, the arrangement is so devised that the inner cylindrical wall 7 constitutes one wall of the space 2 containing the power unit 5, the outer cylindrical wall 8 constitutes an outer wall of the apparatus extending between the end wall units 3 and 4, and the ends of the space 9 defined by the walls 7, 8 enclosing the filter element 6 are open.

The end wall unit 3 forming the gas inlet unit may include an annular passage 10 into which at least one gas supply conduit 11 opens, this gas supply conduit 11 preferably being connected to the end wall unit 3 by a quick-coupling and adapted to direct the gas flow in a manner to cause the latter when flowing through the passage 10 in one direction to rotate so as to create a cyclone effect.

In order to provide simple means for effectively preventing spark transfer to the filter unit 1, the annular passage 10 extends beneath the space 9 containing the filter element 6 of the filter unit 1 and is separated from this space 9 by a partition 13 which is provided with through-flow apertures 12 and preferably made as a separate unit.

In order, in a simple way, to ensure sealing between the end wall unit 3 and filter unit 1, at least one sealing element 14 of a sealing material, preferably rubber, may be superposed on the partition member 13, the wall 7 of the filter unit 1 forming a wall of the space 2 sealingly engaging said sealing element 14 to cause a sealed-off communication passageway between the inner wall 7 of the filter unit 1 defining the space 2 and the end wall unit 3 constituting the inlet unit of the apparatus.

To the end of enabling quick assembly of the filter unit 1 and end wall unit 3 while ensuring efficient sealing action, the end wall unit 3 constituting the inlet unit includes an outer peripheral edge portion or rim 15 adapted, on one hand, to form a catch or socket for holding an annular sealing element 16 of a sealing material sealingly engaged by the outer cylindrical wall 8 of the filter unit 1, and, on the other hand, to form a guiding edge for said outer wall 8.

The guiding of the outer wall 8 of the filter unit in connection with assembly of the filter unit 1 and end wall unit 3 can be further improved by forming the partition member 13 with an outer peripheral edge portion or rim 17 engaging the sealing element 16 and defining with the guiding edge of the edge portion 15 an annular recess of clearance into which the outer edge of wall 8 projects.

In the embodiment illustrated, a thin walled but very rigid end wall construction is provided owing to the fact that a wall ele-

ment 18 forming part of the end wall unit 3 constituting the inlet section, on one hand defines the annular passage 10 and, on the other hand, forms the edge portion 15 outside this passage 10, and, further, inside the passage 10 comprises a wall portion 19 which directly or indirectly defines the space 2.

The power unit 5 may be mounted on both end wall units 3 and 4, being connected to the inlet end wall unit 3 by at least one clamp screw 20, which can be unscrewed to enable the filter unit 1 to be disconnected from the outlet end wall 4 and the power unit 5, as well as from the inlet end wall 3.

In order, for the purpose of cooling and noise-muffling, to cause the cleaned air to sweep the entire power unit, the latter has a casing 21 defined with the filter unit 1a through flow space 22 extending along the major portion of the length of the filter unit 1 and communicating at one end thereof with the space 9 containing the filter element 6 of filter unit 1, and at the opposite end thereof with the power unit 5 through at least one inlet opening 23 in the casing 21.

To enable the apparatus to be used in operation as a warming stool, the outlet end wall unit 4 comprises a seat 24 having beneath the same a space 25 receiving heated gas flowing upward from the power unit 5, said space 25 being open beneath an outer edge portion 26 of the seat 24.

The end wall unit 4 may have associated therewith a carrier 27 for the power unit 5, this carrier 27 being formed with a protective collar 28 adapted to prevent any water or other fluids or objects penetrating in beneath the seat 24 from proceeding further and enter outlet openings and pass therethrough down to the power unit 5. The carrier 27 may suitably form an attachment for at least one control 29 for manually controlling the power unit 5, and/or an attachment for an operating switch 30 for automatically switching the power unit 5 in and out.

In order to retain the filter unit 1 in a fixed position within the apparatus without necessitating any use of parts creating a high level of air resistance, the end wall 4 includes an end wall 31 spaced from the filter element 6 of filter unit 1 by at least one spacer element 32, preferably in the form of a grid, which is adapted to prevent and displacement of the filter element 6 in the gas flow direction, but to allow gas flow from the space 9 of the filter unit 1 to the space 2 containing the power unit 5. The end wall 31 preferably has an outer peripheral edge portion or rim 33, which, on one hand, forms a catch for retaining a sealing element 34 of a sealing material sealingly engaged by the outer barrel 8 of the filter

unit 1, and, on the other hand, forms a guiding edge for the outer barrel 8.

To enable access to the power unit by separating one end wall unit 4 from the filter unit 1, the apparatus is so designed that the power unit 5 and/or an outer casing 21 (if any) enclosing the power unit 5 is detachably associated with the outlet end wall unit 4. To provide a filter element having fan-noise muffling properties, high particle separation capacity and high stability, the filter element 6 comprises superposed layers 36, 37 (Fig. 3) defining with each other elongated passageways 38, 39 the juxtaposed layers extending helically about the inner cylindrical wall 7 in a manner to enable gas coming from the inlet end wall unit 3 to flow through the passageways 38, 39 towards the outlet end wall unit 4 and leave the filter element 6 after having passed through the filter layers.

The filter element 6 will have particularly long service life, high particle separating capacity and, in addition, high durability against both internal and external pressure loading, if at least one of the fibrous material layers 37 divides a space between filter material layers 36 disposed at both sides thereof into inflow passageways 38 having substantially larger cross-sectional areas than those of the outflow passageways 39, so as to form at least one inflow passageway system having essentially larger through-flow area than that of the outflow passageway system, whereby solid particles separated from the gas can be stored within the inflow passageway system without the through-flow area of the latter getting smaller than that of the outflow passageway system.

In order to utilize the space between the fibrous material layers in a particularly effective way as regards particle collection, and also to establish a durable filter pack, the intervening fibrous material layer 37 is designed to define inflow passageways 38 of a cross-sectional shape essentially different from that of the outflow passageways 39.

In order to automatically control the operation of the filtering apparatus in relation to a welding operation and thereby save time and import to the power unit 5 and the filter unit 6 as long a service life as possible, an arrangement according to the invention and comprising at least one switch 30 for switching the power unit on and off is provided. The switch 30 is actuated to switch the power unit 5 on and off in response to changes in strength of a magnetic

field created around an electric cable 41 connecting a welding unit to a source of supply.

In order to ensure that the electric cable 41 remains in the operating position set the filtering apparatus may be provided with at least one socket 40 for holding the welding cable.

The switch 30 may preferably include a sensor 42 adapted to sense changes in the magnetic field of the welding cable 41 and to actuate a timer circuit 43 which, in its turn, actuates a switch 44 adapted to close or open a circuit 45 energizing the drive motor 46 of the power unit 5.

The structural embodiment of said control arrangement may, of course, vary. For example the socket 40 may have the form of a recess provided in a seat 24 forming part of the outlet end wall unit 4. The recess 40 may extend across the seat 24 and declines from the centre of the seat towards its edges.

Certain aspects of the filtering apparatus disclosed herein form the subject of my Application No. 10700/77 (Serial No. 1,579,881), and the filter unit is also disclosed and claimed in my copending Application No. 39440/78 (Serial No. 1,579,883).

#### WHAT I CLAIM IS:—

1. A filtering apparatus for separating solid particles from welding gases which are created during welding with an electrically-fed welding unit connected by an electric cable to a source of supply, said apparatus comprising a filter element, at least one electrically driven fan for transporting a flow of gas through the filter element, and means for switching said at least one fan on and off, said means comprising at least one switch and means for actuating said switch comprising means capable of responding to the creation or collapse of a magnetic field around the cable due to the flow or cessation of an electric current through the cable.

2. Filtering apparatus as claimed in Claim 1, including at least one socket for holding the electric cable.

3. Filtering apparatus as claimed in Claim 1 or 2, wherein said means for actuating said switch includes a sensor adapted to sense the magnetic field around the electric cable and to actuate a timer circuit which, in its turn, actuates said switch to close or open a circuit containing the fan drive motor.

4. Filtering apparatus as claimed in Claim 2, wherein said socket is in the form

of a recess provided in a seat forming part  
of a housing for the fan.

5. Filtering apparatus as claimed in  
Claim 4, wherein said recess extends across  
5 the seat and declines from the centre of the  
seat towards its edges.

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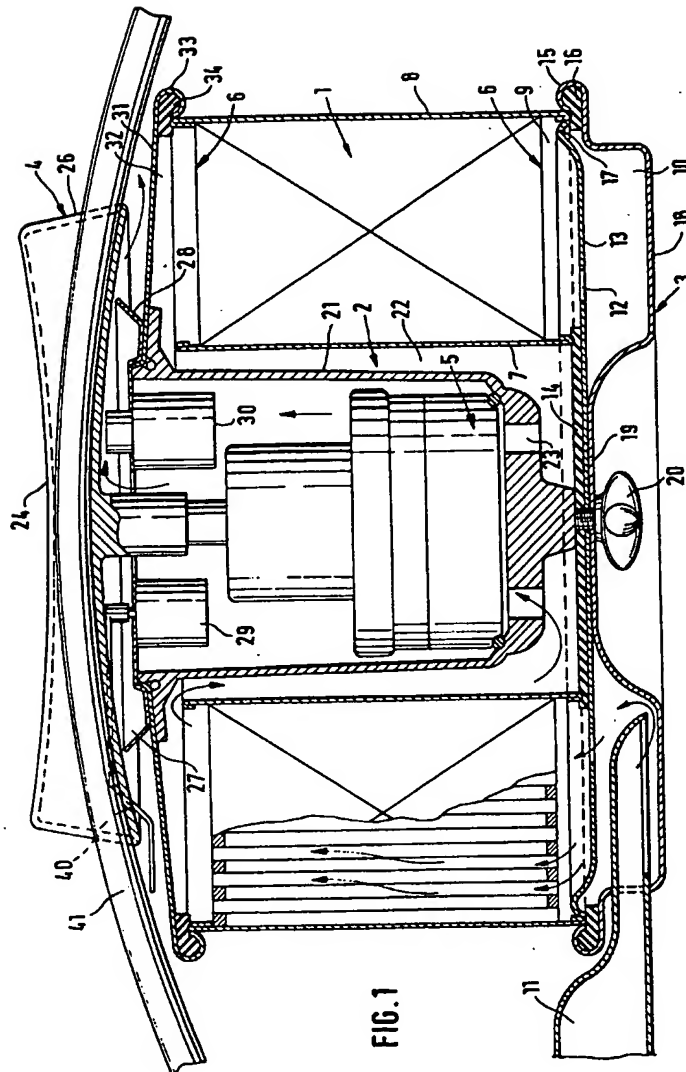
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FIG. 2

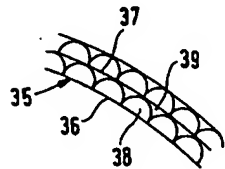
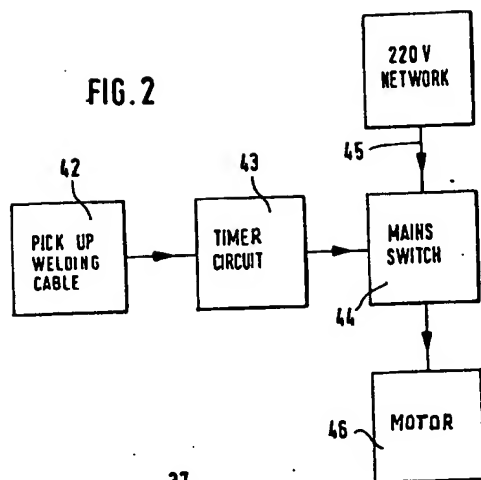


FIG. 3